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MODIFICATION OF EINSTEIN'S EQUATION OF MOTION OF A TEST PARTICLE IN A "WEAK GRAVITATIONAL FIELD"

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Einstein (1921) and more recently Davidson (1957) have investigated the equation of motion of a test particle under the "weak field approximation". While Einstein obtained the equation (in his notation)

$$\frac{d}{dl}(1+\sigma)\vec{v} = \vec{\nabla}\sigma + \frac{\partial \vec{A}}{\partial l} + (\vec{\nabla}\times\vec{A})\times\vec{v}$$

Davidson pointed out an "inconsistency" in Einstein's calculation and gave the equation

$$\frac{d}{dl}(1+3\sigma)\vec{v} = \vec{\nabla}\sigma + \frac{\partial \vec{A}}{\partial l} + (\vec{\nabla}\times\vec{A})\times\vec{v}$$

A careful reexamination of the approximation procedure has however led the author to the following equation

$$\frac{dv}{dl} = \vec{\nabla}\sigma + \frac{\partial \vec{A}}{\partial l} + (\vec{\nabla}\times\vec{A})\times\vec{v} - 3\frac{\partial \sigma}{\partial l}\vec{v} \qquad .. \quad (1)$$

Where following Einstein v has been regarded a small quantity of the order 1/2, σ, a small quantity of order one. Terms which are small of the order one compared to the lowest order terms appearing in the equation, have been neglected and the terms which are small of the order 1/2 compared to the lowest order terms appearing have been retained.

Equation (1) does not give the dependence of intertial mass on σ as expected from Mach's principle, but a new term $-3\frac{\partial\sigma}{\partial l}\vec{v}$-appears in the "force expression" i.e. in the right hand side, when the field is nonstatic.

But if one agrees to retain the terms which are small of order one compared to the terms of the lowest order, one gets the "rate of change of momentum" expression i.e. the left hand side as

$$\frac{d}{dl}\left(1+3\sigma+\frac{1}{2}v^2\right)\vec{v} \qquad .. \quad (A)$$

Expression (A) gives a dependence of inertial mass of σ as required by Mach's principle and it also give the familiar increase of mass with velocity as obtained in the special theory of relativity, Since, according to Einstein v^2 is of the same order as σ, the neglect of v^2 and retention of σ in Einstein's equation cannot be justified.

But, if we retain the terms which are small of order one compared to the lowest order terms the calculation of "force expression" i.e. the right hand side requires an investigation of the nonlinear terms in the field equatios.

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A NOTE ON DIRECT GENERATION OF PSEUDO RANDOM FREQUENCY SHIFT SEQUENCES

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For testing of transmission networks utilising frequency shift keying it is desirable to have some known deterministic pattern of frequency variation with time. The pattern should have a pseudo-noise character, that is, probability of transition at the end of each bit interval should be one half, as would be expected of a real signal. Utilising such pseudo-random sequences one can measure the expected probability of error and effects of transmission impairments quickly and easily. Pseudo-Random Frequency Shift (PRFS) sequences also find application in N-ary communication system where a particular sequence of M different frequencies corresponds one-to-one to one of N Possible states of the message source.

One way of generating such sequences is to frequency modulate an oscillator with an M-ary PR sequence. In the case of binary ($M = 2$) PR sequences, it is known that such sequences (Golomb 1964, Chakrabarti *et al*, 1966) can be generated by a linear sequential circuit having a cascade of shift registers or digital delay units in combination with a logic circuit consisting of modulo two adders